

Autodesk CFD: Fluid flow - Instructor Guide

This instructor guide is a comprehensive tool for facilitating this course in the classroom. Prepare to teach this course by thoroughly reviewing this document, as well as all related course materials and resources. You don't need be expert in Autodesk® Fusion 360™ to deliver this course, but you should understand the foundational concepts associated with Computational Fluid Dynamics. If you are new to Fusion 360 and/or new to CAD, we suggest developing a solid foundation in the core concepts of Fusion 360 before presenting this course to your students.

The following learning resources are pre-requisites to help prepare you in supporting your students through this course.

Fusion 360: Foundational Concepts (academy.autodesk.com) explores core concepts behind Fusion 360 CAD/CAM through a series of lectures and hands-on exercises. We highly recommend you enroll in this course if you are new to Fusion 360 and/or new to CAD.

We've summarized the core Fusion 360 skills in Fusion Mastery: Working with imported geometry course so you can familiarize yourself with them before delivering this learning content in the classroom. It's always recommended that you work through the course yourself in preparation for each lesson.

- Sketch – Basic Sketch Modeling.
- Sketch – Application of Dimensions and Constraints.
- Feature – Extrude, Revolve, Sweep and Fillet.
- User Interface – Workspace Navigation.

Each lesson is listed below along with suggested time allocations for instruction. The referenced demonstrations are based on the step-by-step instruction included in the course. Review the video tutorials and/or step by step print guides for the detailed instruction in each lesson.

Lesson 1: Getting started

Total Time Required for Lesson: 20 minutes

Discuss Objectives: 3 Minutes

Demonstrate: 10 Minutes

- Review course overview and learning objectives
- Download the course resources and software
- Create an Autodesk ID
- Install the software

Hands on Time: 5 Minutes

Review Objective: 2 minutes



Sign In

Don't have an Autodesk account? [Signing up is easy](#)

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Sign In

Lesson 2: Overview of fluid flows

Total Time Required for Lesson: 20 minutes

Discuss Objectives: 3 Minutes

Video Lecture: 6 Minutes

Demonstrate: 5 Minutes

- Be familiar with the methodologies used to calculate the flow of fluids.

Hands on Time: 5 Minutes

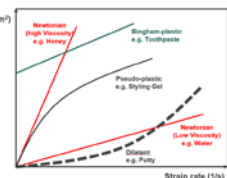
Review Objectives: 2 minutes

Understanding viscosity

- Fluid viscosity varies in behavior from simple Newtonian fluids to more complex Pseudo-plastic fluids.

- Common engineering fluids are Newtonian.

- Water
- Steam
- Air
- Oils



Lesson 3: Numerical methods

Total Time Required for Lesson: 18 minutes

Discuss Objectives: 2 Minutes

Video Lecture: 2 Minutes

Demonstration: 3 Minutes

- Be familiar with the application of numerical methods.
- Compare different numerical methods.

Hands-on Time: 5 Minutes

Review Objectives: 2 minutes

Discretization methods

- Finite Volume
 - Primarily used in aerodynamics applications
 - Solves an integral form of the governing equations so that local continuity property do not have to hold.
- Finite Difference
 - Used to place a finite limit of the derivative calculation
 - Limited by the complexity of the domain
- Finite Element
 - Used for complicated computational regions

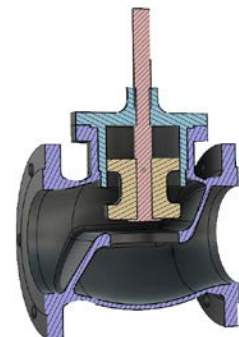
Lesson 4: Establishing boundary conditions

Total Time Required for Lesson: 25 minutes

Discuss Objectives: 3 Minutes

Demonstration: 8 Minutes

- Simplify a model to prepare for export.
- Develop a solid model of the fluid volume.
- Export model to Autodesk CFD.
- Understand simulation workflow.



- Set up boundary conditions.
- Apply a mesh to the study model.

Hands-on Time: 10 Minutes

Review Objectives: 2 minutes

Lesson 5: Steady flow CFD analysis

Total Time Required for Lesson: 20 minutes

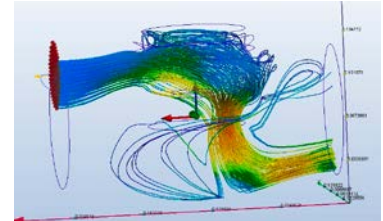
Discuss Objectives: 3 Minutes

Demonstration: 5 Minutes

- Identify types of steady flow.
- Examine considerations for steady flow.
- Run a steady flow study.

Hands-on Time: 10 Minutes

Review Objectives: 2 minutes



Lesson 6: Unsteady flow CFD analysis

Total Time Required for Lesson: 30 minutes

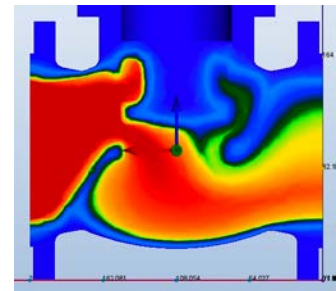
Discuss Objectives: 3 Minutes

Demonstration: 10 Minutes

- Describe unsteady flow.
- Find the Courant number for unsteady flow.
- Run an unsteady flow study.

Hands-on Time: 15 Minutes

Review Objectives: 2 minutes



Next Steps

Total Time Required for Lesson: 10 minutes

Discuss Objectives: 1 Minutes

Demonstration – 1 Minutes

- Launch website <http://academy.autodesk.com> and <http://academy.autodesk.com/portfolios>
- Share designs to Portfolio
- Continue to develop your expertise in Fusion 360 Simulation and enroll in one of the following courses.
 - Fusion 360 Simulation: Working with imported geometry
 - Fusion 360 Simulation: Linear material analysis
 - Fusion 360 Simulation: Nonlinear material analysis
 - Fusion 360 Simulation: Thermal analysis
- Review Inspiration menu for real world examples of industry design

Hands-on Time: 5 Minutes

Review Objectives: 3 minutes